

# NASA TECH BRIEF

## *Marshall Space Flight Center*



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### A Generalized Approach To Computer Synthesis of Digital Holograms

#### The problem:

When a digital computer is used to construct a hologram, the resulting image is not as good as that obtained by conventional methods.

#### The solution:

The hologram is constructed by taking a number of digitized sample points and blending them together to form a "continuous" picture. However, this new system selects a better set of sample points from which the hologram is constructed. The result is an improved hologram from the same amount of information.

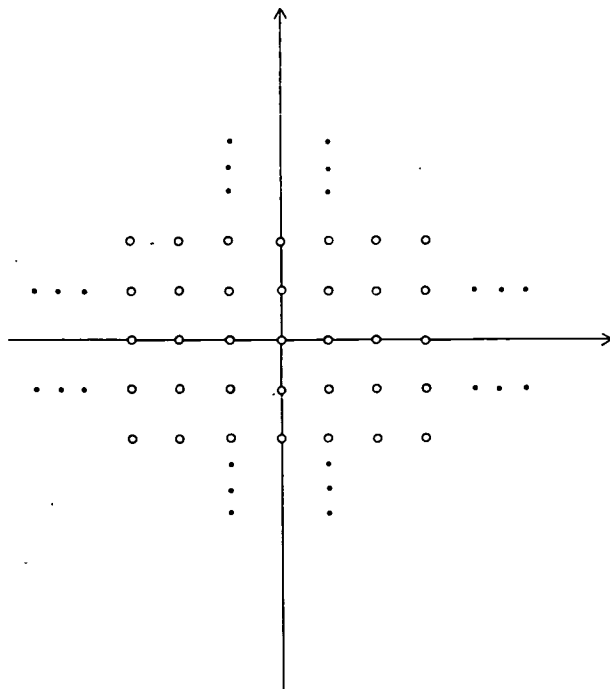


Figure 1. A Square Lattice Of Sampling Points

#### How it's done:

The holographic field is constructed by the computerized application of a modified fast Fourier transform to a set of digitally encoded data. Previously, the field was constructed from a set of sample points forming a square lattice as shown in Figure 1. The square lattice of sampling points is not optimal in the sense that some other set of lattice points may represent the image equally well, but require fewer sample points for a given image size. A set of lattice points, with a basic cell in the shape of a  $120^\circ$  rhombus, as shown in Figure 2, forms a lattice closer to the optimum. This rhombus allows fewer sample points to be used for a given image size.

In general, the optimal locations for the sampling points may be determined by the use of generalized, multi-dimensional sampling techniques. In this way, computer generated holograms can be made to be as good as conventional holograms and may be applied to optical information processing systems, optical data storage, testing of optical equipment, and other areas in which holograms might be used.

#### Notes:

1. Information concerning this innovation may be of interest to the designers and users of optical data storage and processing systems.
2. Requests for further information may be directed to:  
Technology Utilization Officer  
Marshall Space Flight Center  
Code A&PS-TU  
Marshall Space Flight Center, Alabama 35812  
Reference: B73-10101

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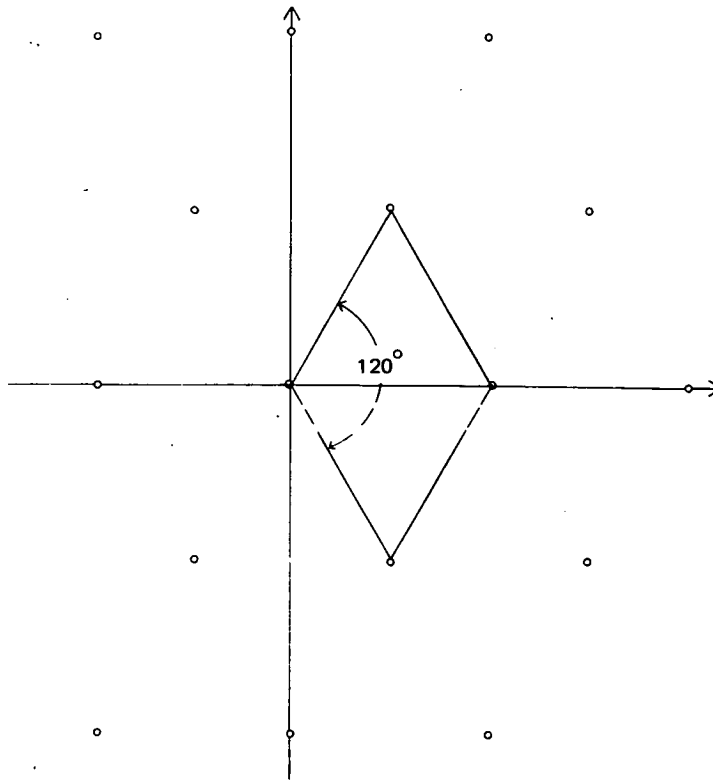


Figure 2. A Sampling Lattice Of Which The Basic Cell Is A  $120^\circ$  Rhombus

**Patent status:**

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel  
Marshall Space Flight Center  
Code A&PS-PAT  
Marshall Space Flight Center, Alabama 35812

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